

What is Claimed is:

1. An assembly for purifying a fluid comprising a rotatable centrifuge, a purifying chamber in said centrifuge, filter structure in said purifying chamber for removing contaminants from the fluid, a fluid supply line communicating with said purifying chamber for supplying the fluid to be purified, a fluid discharge line communicating with said purifying chamber for removing purified fluid from said purifying chamber, and a contaminant discharge line communicating with said purifying chamber for discharging the contaminants removed from the fluid.
2. The assembly of claim 1 including a purifying fluid supply line communicating with said purifying chamber.
3. The assembly of claim 2 wherein said purifying chamber comprises a plurality of co-arcuately aligned modules mounted in said centrifuge, and each of said modules having separate inlets for connection to said fluid

supply line and said purifying fluid supply line and separate outlets for each of said fluid discharge line and said contaminant discharge line.

4. The assembly of claim 3 including a manifold mounted in said centrifuge, said supply lines and said discharge lines leading to and communicating with said manifold and said manifold having supply lines and discharge lines communicating with each of said modules.
5. The assembly of claim 4 wherein said manifold includes a plurality of co-axially aligned disks, each of said disks having a plurality of passages which are alignable with passages of the other of said disks whereby a flow passage may selectively be created between said supply and discharge lines entering said manifold, and said supply and discharge lines connecting said manifold with said modules.
6. The assembly of claim 5 wherein a separate one of each of said disks functions to

distribute the fluid for a separate one of said supply lines and discharge lines.

7. The assembly of claim 6 wherein said disks are identical to each other.
8. The assembly of claim 7 wherein said disks includes indicating structure to facilitate proper alignment of said disks.
9. The assembly of claim 4 wherein each of said modules comprises a closed chamber having an arcuate inner wall and a coarcuate outer wall, said inlet for said fluid supply line being located in said inner wall opposite said outlet for said fluid discharge line in said inner wall, and said inlet for said purifying fluid supply line being located in said inner wall opposite said outlet for said contaminant discharge line in said inner wall.
10. The assembly of claim 9 wherein said filter structure is a stack of alternately arranged dialysate plates and membranes.

11. The assembly of claim 10 wherein each of said modules is formed from a first shell member peripherally connected to a second shell member, said inner wall being part of said first shell member, said outer wall being part of said second shell member, and each of said plates having a hole in line with said outlet for said fluid discharge line.
12. The assembly of claim 11 wherein said outer wall has an access opening in line with said holes in said membranes, and a closure closing said access opening.
13. The assembly of claim 10 wherein said stack of plates and membranes includes a plurality of plates arranged in spaced parallel relationship with one of said membranes between each pair of plates to form a chamber on each side of said one membrane, one of said chambers being a blood flow chamber and the other of said chambers being a dialysate flow chamber, one of said pair of plates having a blood side disposed toward said blood flow

chamber, said blood side having a longitudinal central portion with blood channels extending laterally across said central portion, a longitudinal edge portion on each side of said central portion, said edge portions having blood channels disposed longitudinally generally perpendicular to said lateral blood channels, a blood inlet communicating with one of said edge portions, a blood outlet communicating with the other of said edge portions, said other of said pair of plates being disposed toward said dialysate flow chamber and having a dialysate flow side, said dialysate flow side having a central portion with longitudinal dialysate flow channels, a cover located between said pair of plates at said longitudinal edge portions at each longitudinal side of said membrane, and said stack of plates and membranes and covers being sealed in a respective one of said modules.

14. The assembly of claim 13 wherein said longitudinal dialysate flow channels have a sawtooth flow pattern, each of said plates having flow channels at each end thereof on each side of said plate, said flow channels at one end being in a centrally located set, said flow channels at the other end being in two spaced sets, holes extending through said plate to create communication between said flow channels on each side of said plate whereby dialysate may flow through said plate and enter said two spaced sets of flow channels and then flow through said longitudinal flow channels and then into said centrally located set of flow channels, and each of said plates being disposed in a position rotated 180° with respect to its adjacent plate.
15. The assembly of claim 4 wherein said manifold includes a plurality of co-axially aligned disks, each of said disks having a plurality of passages which are alignable with passages

of the other of said disks whereby a flow passage may selectively be created between said supply and discharge lines entering said manifold and said supply and discharge lines connecting said manifold with said modules.

16. The assembly of claim 15 wherein a separate one of each of said disks functions to distribute the fluid for a separate one of said supply lines and discharge lines.
17. The assembly of claim 3 wherein there are four of said modules forming a 360° arc.
18. The assembly of claim 2 wherein said assembly is used for purifying blood, said fluid supply line feeding whole blood said fluid discharge line feeding purified blood said contaminant discharge line feeding contaminants removed from the blood said purifying fluid feeding dialysate, and said filter structure being a stack of parallel membranes.
19. The assembly of claim 1 wherein said assembly is used for purifying blood, said fluid

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supply line feeding whole blood, said fluid discharge line feeding purified blood, said contaminant discharge line feeding contaminants removed from the blood, said purifying fluid supply line feeding dialysate, and said filter structure being a stack of parallel membranes.

20. The assembly of claim 1 wherein said purifying chamber comprises a plurality of co-arcuately aligned modules mounted in said centrifuge, each of said modules having separate inlets for connection to said fluid supply line and said purifying fluid supply line and separate outlets for each of said fluid discharge line and said contaminant discharge line.
21. The assembly of claim 20 including a manifold mounted in said centrifuge, said supply lines and said discharge lines leading to and communicating with said manifold, and said manifold having supply lines and discharge



lines communicating with each of said modules.

22. The assembly of claim 1 wherein said filter structure is a stack of alternately arranged dialysate plates and membranes, said stack of plates and membranes including a plurality of plates arranged in spaced parallel relationship with one of said membranes between each pair of plates to form a chamber on each side of said one membrane, one of said chambers being a blood flow chamber and the other of said chambers being a dialysate flow chamber, one of said pair of plates having a blood side disposed toward said blood flow chamber, said blood side having a longitudinal central portion with blood channels extending laterally across said central portion, a longitudinal edge portion on each side of said central portion, said edge portions having blood channels disposed longitudinally generally perpendicular to said lateral blood channels, a blood inlet communicating with

one of said edge portions, a blood outlet communicating with the other of said edge portions, said other of said pair of plates being disposed toward said dialysate flow chamber and having a dialysate flow side, said dialysate flow side having a central portion with longitudinal dialysate flow channels, a cover located between said pair of plates at said longitudinal edge portions at each longitudinal side of said membrane, and said stack of plates and membranes and covers being sealed in a respective one of said modules.

23. A dialyzer for purifying blood comprising a module having a stack of alternately arranged dialysate plates and membranes, said stack of plates and membranes including a plurality of plates arranged in spaced parallel relationship with one of said membranes between each pair of plates to form a chamber on each side of said one membrane one of said chambers being a blood flow chamber and the other of

said chambers being a dialysate flow chamber, one of said pair of plates having a blood side disposed toward said blood flow chamber, said blood side having a longitudinal central portion with blood channels extending laterally across said central portion, a longitudinal edge portion on each side of said central portion, said edge portions having blood channels disposed longitudinally generally perpendicular to said lateral blood channels, a blood inlet communicating with one of said edge portions, a blood outlet communicating with the other of said edge portions, said other of said pair of plates being disposed toward said dialysate flow chamber and having a dialysate flow side, said dialysate flow side having a central portion with longitudinal dialysate flow channels, a cover located between said pair of plates at said longitudinal edge portions at each longitudinal side of said membrane,

and said stack of plates and membranes and covers being sealed in said module.

24. The dialyzer of claim 23 wherein said longitudinal dialysate flow channels have a sawtooth flow pattern, each of said plates having flow channels at each end thereof on each side of said plate, said flow channels at one end being in a centrally located set, said flow channels at the other end being in two spaced sets, holes extending through said plate to create communication between said flow channels on each side of said plate whereby dialysate may flow through said plate and enter said two spaced sets of flow channels and then flow through said longitudinal flow channel and then into said centrally located set of flow channels, and each of said plates being disposed in a position rotated  $180^{\circ}$  with respect to its adjacent plate.
25. A method of purifying a fluid comprising supplying the fluid to be purified into a

purifying chamber in a centrifuge, disposing filter structure in the centrifuge, rotating the centrifuge to separate lighter components of the fluid from heavier components of the fluid, filtering contaminants from the heavier components of the fluid by passing the heavier components of the fluid through the filter structure, discharging the purified fluid from the centrifuge, and discharging the contaminants from the centrifuge.

26. The method of claim 25 wherein the fluid to be purified is blood and the filter structure is a stack of dialysate membranes, the lighter components of the fluid being the cells of the blood and the heavier components being the plasma, feeding fresh dialysate into the purifying chamber to remove contaminants from the plasma, and discharging the used dialysate with the contaminants which have been removed from the plasma.
27. The method of claim 26 wherein the purifying chamber is in the form of a plurality of co-

arcuately arranged modules, feeding the whole blood and the dialysate into a manifold and then to the modules, and removing the purified blood and used dialysate/contaminants from the modules to the manifold and out of the centrifuge.

28. The method of claim 27 wherein the manifold includes a plurality of coaxially aligned disks having alignable passageways, and utilizing a separate disk to distribute the whole blood to the modules and a further separate disk to distribute the dialysate to the modules and a further separate disk to collect and discharge the purified blood and a further separate disk to collect and discharge the used dialysate/contaminants.
29. The method of claim 28 wherein the whole blood is removed from a patient through a catheter and the purified blood is fed into the patient through the catheter on a continuous basis.

30. The method of claim 26 wherein the blood is removed from a patient and supplied to the centrifuge through a supply tube, the purified blood being returned from the centrifuge to the patient through a discharge tube, periodically cutting through and sealing the supply tube and the discharge tube by a sterile connection device, and reconnecting and opening the sealed supply tube and discharge tube from the patient to a corresponding supply tube and discharge tube from the centrifuge by a sterile connection device.

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